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January 5, 2007

Mr. John Carrigan, Section Chief
Department of Environmental Protection
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

Re: Crow Lane Landfill, Newburyport, MA

Dear Mr. Carrigan:

On behalf of our client, New Ventures Associates, LLC, we are submitting supplemental information concerning the Amended Corrective Action Design (CAD) prepared for the Crow Lane Landfill. This supplemental submittal includes the following documents and narrative:

- a completed design for modifications to the landfill gas extraction and final capping systems as prepared by Cornerstone Environmental Group, LLC for the remainder of the landfill under full build-out conditions;
- amendments to the CAD design drawings prepared by SITEC Environmental, Inc. to coordinate with and reference the Cornerstone drawings;
- discussion concerning the proposed limits for the installation of the HDPE Geomembrane capping materials at the perimeter of the landfill;
- a response to technical review comments received from the Department on the original CAD submittal drawings; and
- modifications to the stormwater management system and calculations to address comments received from the City of Newburyport's environmental consultant concerning the hydrology associated with the easterly wetland and adjacent vernal pool located to the south of Crow Lane.

Also included with this supplemental submittal is a preliminary report prepared by GeoComp Corporation regarding the requested analysis of the perimeter berm. Based on the work conducted by GeoComp to date, it is recommended that additional measures be incorporated into the design and construction of this berm to ensure that it functions as intended and that it satisfies all Department and relevant design standards regarding structural stability. The current recommendation from GeoComp is that the outer slope of existing perimeter berm that is constructed along westerly side of the landfill be reduced to 1.5 horizontal to 1 vertical (1.5H:1V) and that additional berm construction, as necessary to achieve final berm elevations, be conducted using Mechanically Stabilized Earth (MSE) construction techniques. This method

of construction incorporates the use of structural geogrid reinforcing materials within the berm. This construction material and technique is also recommended for the construction of the southerly perimeter berm that is to be built at a 1H:1V slope. A final report, along with detailed design drawings and specifications for berm construction, will be submitted to the Department by no later than January 19, 2007. The GeoComp report is included as Attachment 1 to this letter.

Landfill Gas System Modifications:

As you are aware, New Ventures has retained the services of Cornerstone Environmental Group, LLC to complete an alternate design for the collection of landfill gas at the facility. Cornerstone had initially developed detailed design plans for the installation of the horizontal gas collection system that is currently being installed directly below the cap system within what are referred to as the Phase 1 and Phase 2 final closure areas. These areas encompass the entire northerly and westerly portions of the landfill. An expanded closure area and horizontal gas system expansion was subsequently approved by the Department based on a plan prepared by SITEC. Cornerstone has now completed a design for the full build-out of the landfill and gas collection system, which is included as part of this submittal. This design includes the continuation of the horizontal gas collection trench network throughout the entire landfill area that are to be interconnected with an independent HDPE header piping that will encircle the landfill once final grades are achieved.

The Cornerstone design also includes a modification to the final capping system components that were proposed by SITEC within the Amended Corrective Action Design submitted to the Department on March 17, 2006. This modification includes the elimination of the six (6) inch thick sand gas vent layer and substitution of TENAX geocomposite material layer to be installed directly beneath the HDPE membrane cap. This design of the final cover system is also carried through for the full build-out and final closure.

Cornerstone has utilized the SITEC drawing entitled "Landfill Gas Management Plan" Drawing No. 4 as their base map upon which they have prepared their design. This SITEC drawing was submitted to the Department as part of the Amended CAD drawing set in March 2006. The SITEC layout of the gas extraction system, vertical extraction wells, piping and appurtenances, is retained on the Cornerstone plan and has been modified slightly. These changes include the conversion of Temporary Gas Wells TEW-1 and TEW-2 to permanent wells in place of proposed wells EW-9 and EW-10 and minor adjustments to the alignment of header piping so that both headers could be installed within the same trench. This concept minimizes landfill disruption and possible odor episodes. Whereas the Cornerstone Site Plan incorporates the complete layout of both the horizontal and vertical gas systems, the SITEC Landfill Gas Management Plan has been deleted from the CAD drawing set. The SITEC Landfill Gas Management System Details, (Drawing No. 8) for this portion of the gas system remains in the set but has been modified mainly due to the replacement of the sand gas vent layer with the geocomposite in the final cap.

The Cornerstone Site Plan depicts the permanent flare location at its original location as previously shown by SITEC within the March Amended CAD submittal. New Ventures has subsequently determined that an alternate location would be more suitable for this landfill gas management compound area. This location is presented on the SITEC drawing entitled Final

Grading and Storm Water Management Plan, Drawing No. 3. This location is more suitable as it is situated off the landfill footprint and provides supplemental area for the landfill gas pretreatment units and appurtenances. A small reconfiguration of storm water detention basin No. 1 was required to create this gas system area. This reconfiguration was accounted for within the enclosed drainage calculations discussed further in the report. The main header piping from the landfill will penetrate the landfill cap (with a boot seal) and will be extended across the perimeter berm below grade and will resurface at the pretreatment units and flare for final connection.

Final Closure Details:

As part of the Cornerstone design of the horizontal landfill gas collection system, the six (6) thick landfill gas vent layer sand has been replaced by TENAX geocomposite material throughout the landfill final closure surface. The SITEC drawing entitled "Final Cover System Details and Stormwater Management System Details 1", (Drawing No. 6) has been modified to reflect this change in the final cover system design with appropriate references to the Cornerstone plans.

Limit of Cap at Perimeter Berm:

SITEC Drawing No. 5, "Landfill Cross-Sections and Perimeter Access Road/Berm Detail" in the March Amended CAD submittal included a conceptual design for extending the 40 mil HDPE geomembrane cap completely over the berm and down the exterior slope of the berm. A surface treatment for the face of the berm had not been determined at that time. The reasoning for extending the membrane over and down the berm was to create a seal or barrier around the perimeter of the landfill that would prevent ambient air from being pulled through the berm with the operation of the active landfill gas extraction system that now exists and is in operation. Establishing a barrier was a requirement of the Department within their earlier approval for the construction of the berm. GZA GeoEnvironmental, Inc., the previous engineering consultant, had addressed the barrier requirement with a proposed vertical clay cutoff wall that they had intended on having constructed progressively with the filling of the berm. It is reported by New Ventures that the berm construction has progressed to its current elevations without this design feature in-place.

The concept of extending the membrane over the berm and down the outside slope has been reconsidered and a determination has been made concerning its constructability. It is the opinion of SITEC that the placement of the membrane to these limits is not a viable alternative. Please note that the SITEC design does, however, include the extension of the HDPE membrane across the berm to a termination point at the top of the outside slope as further described in the report. The determination of constructability was based on the following factors:

- Due to the steepness of the slopes, the placement of a subgrade material suitable for the deployment of a membrane is not practical as uniform placement and compaction could not be accomplished;
- Due to the steepness of the slopes, the placement of earthen materials over the top of the membrane as a protective layer is not practical as interface sliding will surely occur;
- The placement of a crushed stone or rip rap material over the membrane, even with an underlying protective fabric, will cause irreparable damage to the membrane material

rendering it ineffectual.

It is SITEC's opinion that the lack of the impermeable membrane over the berm and/or the clay cutoff wall along the inside edge of the berm (previously proposed by GZA) are not necessary for adequate operation of the active gas extraction system. This opinion is based on the following considerations:

- Eight (8) active landfill gas extraction wells are currently in service along the northerly and westerly slopes of the landfill. These wells were installed in 2005 at the locations proposed by SITEC and approved by the Department. Several of the wells are installed at distances as close as 50 feet to the edge of the landfill and the perimeter berm. The landfill conditions, until just recently, were that there was no landfill final cover system in-place on the slopes and the perimeter berm was without an impermeable barrier or membrane. Though the vacuum on this well field has fluctuated over the past months, at no point has it been reported that there was excess oxygen in the gas stream that could be attributed to air intrusion through either the uncapped slopes or the berm. Conclusion: Ambient air is not being drawn into the wells through the berm.
- New Ventures has retained Cornerstone to develop the horizontal gas collection system that includes an elaborate layout of collection trenches and piping throughout the landfill surface. The design incorporates a gas collection layer geocomposite directly beneath the membrane cap and will apply a low vacuum over the entire landfill surface and maintain a negative pressure directly beneath the membrane for gas collection. This system is designed to collect gas at the landfill surface as it rises and will not have a significant effect at the lower berm elevations where air intrusion was of concern to the Department.
- On April 3, 2006, a series of 18 test pits were excavated into the berm at locations distributed around the entire perimeter of the landfill. These test pits were dug to the capable depth of the excavator for the purpose of examining the materials that were actually used in constructing the berm. It is known that the materials used were not comprised exclusively of 3" crushed concrete or 6" crushed stone as were proposed by GZA and approved by the Department. These materials would have been considered to be extremely porous with many voids between the rock particles. Instead, what was observed was a mix of soil, rock and concrete that appeared to be very dense and compact. It was reported that the operator experienced difficulty in completing the test pits due to the compactness of the in-place materials. Though larger stone and concrete were observed in the open holes and excavated stockpiles, the void spaces appeared to be tightly packed with a fine to course silty sand making the berm considerably less porous than had it been built with crushed rock/stone alone. Sieve analyses performed on the soils samples collected by GeoComp Corporation during the excavation of test pit are included with this report. Based on these observations and the nature of the existing materials, the current berm will act to prevent air intrusion into the landfill and also serve to prevent landfill gas migration.

Based on the considerations described above, it is SITEC's professional opinion that neither a membrane extended out and over the berm nor the construction of the cutoff wall are necessary for the successful closure of the landfill, the containment of landfill gas or the effective operation of the active landfill gas extraction system.

SITEC's modified CAD design provides that the membrane cap and associated final cover system components will be terminated along the ***outside*** edge of the perimeter berm. The membrane covering the landfill and its underlying geocomposite will be secured within an anchor trench that will be excavated into the berm to a depth of three (3) feet along the inside edge of the berm. An additional sheet of HDPE membrane will then be placed over the anchor trench, extrusion welded to the membrane cap and extended over the perimeter berm to the top of the out side slope. The membrane will be placed over a six (6) inch thick layer of suitable fine graded subgrade materials to prevent damage to the membrane. This membrane extension will provide encapsulation to the berm materials, to the extent possible and will prevent runoff infiltration and erosion throughout the entire berm length.

The anchor trench along the inside edge of the berm will be backfill with only suitable materials that will not damage the membrane. Any rock or concrete from the trench excavation will be determined unsuitable for backfill. Also, excavated soils that are thought to have come in contact with leachate from the landfill will be determined to be unsuitable as trench backfill. A reference is made on the drawings and previously submitted reports to the use of what are referred to as "Emulsion Mix" soils. These soils are asphalt stabilized soils that have been determined by the Department to be suitable for use as both daily and intermediate cover materials on landfill applications. This material has also been approved by the Department for use in access road construction at landfill sites outside the landfill foot print. The consistency of this soil and its workability make it well suited for this application as trench backfill.

A stone lined drainage channel will be constructed directly at the base of the landfill slope that will contain and convey storm water runoff from the slopes to the appropriate detention basins or drainage structures. The previously mentioned extension of the membrane across the berm will eliminate the possibility of these drainage channels washing out and causing damage to the perimeter berm as they will be lined with HDPE membrane materials. The entire width of the channel will be lined with a protective covering and stone lining materials are applied. This detail will ensure protection to the berm from erosion and storm water runoff. Stone check dams will also be constructed within the channels at 100 foot intervals to reduce velocities and promote settlement of soils particles. The channels will require periodic maintenance during the post-closure period.

Final details of the HDPE geomembrane cap extension over the top of the berm along with drainage channel construction details will presented within the final design drawings to be submitted to the Department by no later than January 19, 2007

Response to DEP Comments, 10 August 2006:

1. ***The FML has been redesigned to encapsulate the berm. The FML rises under the roadway creating a small dam preventing flow in the drainage layer from crossing the road. Consideration needs to be made to grade the FML so as to allow subsurface flow across the roadway and on into the wetlands.***
   Every effort has been made to mitigate stormwater runoff rates and direct discharge to the adjacent wetland with the use of detention basins and storm water collection structures. Allowing storm water flow from the landfill and access road to cross the roadway and flow directly to the adjacent wetland would further limit the ability of the storm water systems to

mitigate peak runoff rates during all rainfall events. The outside slopes of the perimeter berm will provide some degree of clean runoff to the wetlands. Runoff rates from these slope areas to the wetlands have been calculated and are part the drainage calculations included with this submission.

2. ***No design details for the surface treatment of the outside surface of the perimeter berm.***
GeoComp Corp. is currently completing an analysis and final design for perimeter berm construction. Preliminary analysis indicates that the slope of the outside surface of the existing berm along the westerly side of the landfill will require a reduction in steepness and that further extension of the berm to final elevation will require Mechanically Stabilized Earth (MSE) construction techniques incorporating structural geogrid materials. Similarly, the full construction of the berm along the southerly side of the landfill, at a 1:1 slope, will also require MSE construction. Final details of the perimeter berm and its surface treatment will be included within a supplemental submittal to be made on or before January 19, 2007. Please refer to the enclosed letter report from GeoComp Corp. concerning the stability analysis and design recommendations for the berm.

3. ***Edge of FML is not depicted on grading plan.***
The edge of the FML (membrane) will be terminated at the ***outside*** edge of the perimeter berm as previously described. Details and cross sections of the membrane cap extension across the top of the berm will be included within the supplemental submittal.

4. ***Per the plans, the outer edge of the FML is specified to be anchored by "emulsion mix soil". There is no provision for this material in the specifications. What is this material that it should be considered allowable in an above the FML location?***
Please refer to the discussion above concerning the Limit of Cap and the use of Emulsion Mix materials as trench backfill.

5. ***The Specifications call for the anchor trench to be back filled with trench excavate. This excavate has been exposed to leachate. Why should it be deemed suitable in an above the FML location?***
A determination has been made that the excavate from the anchor trenches will likely by determined unsuitable for use as trench backfill due to the presence of rock and crushed concrete. Contact of the excavate with leachate is also just cause for determining it unsuitable for backfill.

6. ***The Specifications call for the minimum organic content of the loam to be 4%. The Department's design minima for the design selected is 8%. Note: in the design discussion text, the text stipulates the loam shall have a minimum organic content of 8%.***
It is the intent that the loam to be used on this closure project have a minimum organic content of 8% as stated in the text of the CAD engineering report. The specification will be revised prior to loam procurement and placement.

7. ***The design report identifies that the HELP Model was used to design the drainage layer. The HELP Model does not provide adequate data for this purpose.***
The HELP model has been used historically for evaluating the capacity and performance of

the final cover system and continues to be an accepted methodology. SITEC will certainly consider an alternate method recommended by the Department as confirmation that the final cover system will perform adequately. It is our opinion that the final cover system, in conjunction with the network of drainage layer sub-drain piping, will perform adequately in controlling stormwater runoff, preventing erosion and preserving the integrity underlying capping materials.

8. ***Several drainage pipes cross the perimeter access road. No details are provided. Note, as the FML is designed the pipes will need to make multiple penetrations of the FML. These penetrations need to be minimized (see 1, above).***
   The cross pipe on the access road will not penetrate the FML. The landfill surface will be graded to accommodate the piping prior to the construction of the road.

9. ***The storm water collection drain pipe on the southerly side of the landfill is proposed to be below the FML. This requires penetration of the FML.***

   a. ***Can the pipe be located above the FML?***
      The FML will longer be extended over the entire perimeter berm. The piping will however be installed below the lined drainage channel and extended membrane to be constructed over the top of the access road/berm along the southerly side. The piping will be installed beyond the anchor trench and should not interfere with the membrane and penetrations should not be needed.

   b. ***How will the pipe emerge from under the FML. No details are provided.***
      The piping will be installed beneath the extended membrane over the access road/berm and will not interfere with the FML of the landfill cap. All drainage piping will be installed outside the actual landfill cap as shown on the drawings and details.

10. ***The outlet pipe from Detention Basin 1 will terminate in a swale. This termination is not full detailed (location of FML, etc.?). The details of the swale do not appear to describe the major (easterly) portion of the swale. I.e. the swale is depicted mid-way on the perimeter berm, but the details show the swale level with Crow Lane.***
    The FML will no longer extend to the base of the perimeter berm. Therefore there will be no interaction with the Basin 1 discharge culvert. The grading plan Drawing No. 3 presents the design grades for the perimeter swale along the full length of the landfill and along Crow Lane. The detail sheet presents the location of the swale in a conceptual manner running along side Crow Lane. The swale will be deeper at various locations depending on the depth of cut needed to construct the swale to the grades shown.

11. ***Small storm water collection areas located adjacent to Detention Basin 1 to provide transition from the swales to pipes crossing the access road. No details are provided.***
    A detail had been provided showing the transition from the lined collection sump and the culverts that discharge to Basin No. 1. The FML will line the sump and will be booted to the culvert as indicated.

12. ***Grate of CB-1 is above grade. How does water get into the basin?***

The detail has been revised so that the grate is to be set at the final elevation of the drainage channel.

13. ***Plans do not provide for modifying the leachate collection tanks to meet IWW standards (alarms, etc.).***
    New Ventures will consult with technical representatives of the alarm manufacturers to determine equipment needs to satisfy the IWW standards that are applicable to all leachate storage tanks. High liquid alarms with visual and audible indicators will be investigated for installation on permanent tank locations.

14. ***The plans do not identify what will happen to the leachate collection tank located adjacent tot he existing flare.***
    The existing leachate tank at that location is considered temporary and was installed at address a localized leachate breakout. The tank will be removed as grading and shaping material placement operations begin within this area.

15. ***No details are provided for the foundation for the permanent flare.***
    The enclosed flare will be skid mounted and the loadings will be distributed across the skid sub-structure. According to the manufacturer, no special foundation is required other than a compacted stable sub-base which will be constructed of crushed stone.

16. ***No details are provided for how the header system will be connected to the permanent flare.***
    The location of the permanent flare has been moved to the opposite side of the berm as shown on the drawings prepared by SITEC (Drawing No. 3). The final header system piping configuration within the new flare compound area will be developed upon determination of actual field conditions and equipment placement including pretreatment units. It is intended that the main header pipe from the landfill will extend out through the landfill slope and then cross the berm below grade. A membrane boot seal will be constructed at the cap penetration. The header will then resurface at the flare compound for connection to the pre-treatment and flare unit. Existing control valves on the main header line within the landfill will be extended up to final grade so that they will continue to function in isolating the vertical and horizontal gas collection systems.

17. ***Remote wellhead extraction wells are designed with a 4 inch connector pipe to the header. The existing remote wellhead extraction wells (EW-2, EW-3, EW-6) were constructed with a 6 inch connector from the header. Will these connections be replaced to conform to the design?***
    From the header, a 6 inch riser extends upward above the ground surface. The well head is then affixed to the 6 inch riser. The lateral piping from the wellhead to the downslope wells are all 4 inch diameter as designed.

18. ***How do the existing wellheads compare to the proposed wellheads? Where different the existing wellheads need to be replaced.***
    It is anticipated that existing well heads without flow measurement capabilities will be replaced as they become dysfunctional.

19. ***Gas extraction wells include a section identified as a "flow measurement tube assembly". No details are provided for this assembly. How is flow to be measured?***
    The flow measurement tubes are integral to the well head assemblies as manufactured by LandTec. Wellheads completed with LandTec components will be monitored using the GEM 2000 meter that is currently used to monitor gas quality. Flow at wells without LandTec wellhead will be measured by other means that could include the use of a pitot tube and manometer. Training in the use of these devices will be required.

20. ***The plans provide an isolation valve in the header between the connection to the flare and extraction well EW-16. A similar valve is not provided between the flare connection and extraction well EW-2. Why?***
    The isolation valve before EW-16 was intended to facilitate the final connection of the header system.

21. ***The existing conditions depicted do not show the surrounding area to define how the closed landfill will relate to the surrounding conditions. The brook west of the landfill is not shown. The wetlands east of the landfill are not adequately depicted to identify the regional flow patterns of this area. The vernal pool south of the landfill is not adequately depicted.***
    A revised Drawing No. 3, Final Grading and Stormwater management Plan was submitted to the Department in April 2006 emphasizing the un-named brook to the west, the wetland area to the east and the delineation of the vernal pool to the south of the site entrance. The delineation of the vernal pool was done by Wetlands Preservation, Inc. on behalf of the City of Newburyport. Flagging was located by field survey by Hancock Survey. These features continue to be shown on Drawing 3 included with this submission.

22. ***The plans do not provide a permanent bench mark.***
    A permanent bench mark is indicated within the paved portion of Crow Lane. In the event that this bench is lost, elevations have been established by Hancock Survey at each of the groundwater monitoring wells that are installed around the perimeter of the landfill. Elevations at each well are presented on the Environmental Monitoring Plan.

23. ***The plans do not show the ground and surface water monitoring points.***
    An Environmental Monitoring Plan has been prepared and submitted to the Department showing all monitoring wells, piezometers and surface water monitoring stations.

24. ***Sources for the base grade conditions on sheet 10, "Final Capacity Plan" (survey, GZA plan identification, etc.) are not identified.***
    The base grade conditions represent the ground survey performed by Guerriere & Halnon, Inc. in June 2003. SITEC obtained these grades from plans previously prepared by GZA for this project.

25. ***The Construction Quality Assurance Plan doe not provide for documenting the in-place thickness of soil layers.***
    In-place depth measurements will be made by the SITEC CQA field technician within areas

that are designated by the Contractor as being completed. Measurements will be made by both observing grade stakes set for depth control and through the digging of test holes at a frequency of no less than five (5) test locations per acre.

26. Cover sheet is not dated.

A submission schedule with all plan revision dates has been added to the Cover Sheet.

Stormwater Management System Modifications:

The stormwater calculations submitted in the Amended Corrective Action Design (CAD) have been revised to address a number of issues raised by the Newburyport Conservation Commission's review consultant, BSC Group of Boston, MA. BSC offered the following comments regarding the site wide drainage analysis:

"The pre-development hydrogeologic analysis delineated the project limits into two watersheds (sub-basins): one that discharged into the northern wetland and the other that discharged into the western wetland. While this may be acceptable on many development project, it raises concern that the analysis isn't detailed enough to determine if the adjacent resource areas (i.e. the vernal pool to the south and the BVW to the east) are being impacted. We suggest determining the watershed area that discharges into the vernal pool and compare the post-closure runoff rates and volumes into the pool with the pre-development rates and volumes. This comparison will determine if the pool is being negatively affected by the proposed project."

"Similarly, a determination of the watershed discharging into the eastern wetland should also be performed and the post (pre)*-development runoff rates should be compared to the post-development rates. Installing a discharge pipe from Detention Pond 2 into the wetland may be necessary to maintain a similar runoff rate that currently exists."*

SITEC has completed the recommended analysis and has made design modifications to the storm water management system structures to mitigate the potential for impacting these two additional resource areas. Revised drainage calculations, including figures showing the delineation of drainage areas, are included with this submittal and the design modifications are presented on the enclosed drawings. The results of the analysis and a description of the proposed system changes are provide below.

The development of pre-development drainage patterns was performed using the topographic plan prepared by Guerriere and Halnon, Inc. based on a 2003 topographic survey. The drainage or subcatchment area delineation for pre-development conditions, presented on Figure 1 and utilized in the attached stormwater calculations, shows that approximately 3.45 acres (150,666 $ft.^2$) of the landfill surface and adjacent areas contributes runoff to the vernal pool located to the south of Crow Lane and that approximately 2.04 acres (88,843 $ft.^2$) drained to the easterly wetland.

The original drainage calculations did not take these flow directions into consideration and therefore would have resulted in a net reduction in the amount of runoff that had historically drained to these resource areas upon completion of capping and drainage system construction. To maintain continued flow to these areas, secondary outlet control structures have been

proposed for both detention basins.

The secondary outlet control structure proposed for Basin No. 1 will release stormwater from the basin through a culvert at a controlled rate to a rip rap level spreader which will diffuse the stormwater at the perimeter of the vernal pool located to the south of the landfill across Crow Lane. The construction of this discharge will require excavation and culvert installation across Crow Lane along with necessary pavement repairs. The secondary outlet control structure has been designed so that peak flow rates to the vernal pool will not exceed pre-development flow rates. Because there is a limited volume within the vernal pool, the secondary outlet control structure will also mitigate the volume of stormwater runoff being discharged to the vernal pool. We believe that by providing stormwater flow to the vernal pool for all storm events, although decreased from pre-development conditions, there will be no adverse impacts with the construction of the landfill final closure drainage system.

Similarly, a secondary outlet control structure is also proposed for Basin No. 2, which will release stormwater from the basin through a culvert at a controlled rate to a rip rap apron which will diffuse the stormwater into the eastern wetland. This secondary outlet control structure has also been designed so that peak flow rates into the eastern wetland will approximate, but not exceed, pre-development flow rates. We believe that by creating similar hydrologic conditions for the vernal pool and the eastern wetland, there will be no adverse impacts with the construction of the landfill final closure drainage system.

Table 1, which is attached to this letter, provides a summary of peak stormwater flow rates discharging into the four resource areas surrounding the site for both pre-development and post-closure conditions. Table 2 provides a summary of peak volumes discharging to the vernal pool for both pre-development and post-closure conditions. Analyses have been conducted for all minor and major rainfall events. The four resource areas analyzed include the Northern Wetland, The Western Wetland, The Vernal Pool and the Eastern Wetland. Delineated drainage area plans for the pre and post development conditions are also attached as Figures 1 and 2.

In addition to providing similar hydrologic conditions for the vernal pool regarding stormwater flow rates, supplemental treatment associated with stormwater quality has been proposed for stormwater discharging to vernal pool. This supplemental treatment is proposed as further protection to this ecologically sensitive area. A CDS stormwater treatment unit has been proposed for installation on the stormwater discharge from Basin No. 1 to the vernal pool. CDS (Continuous Deflection Separation) is a proven technology that uses the stormwater's energy to accomplish a high efficiency particulate matter separation for solids removal. The structure is also designed with an internal baffle structure, which offers a high degree of oil separation capability. The CDS stormwater treatment unit is proposed for added stormwater quality protection to this sensitive discharge location. This unit, in conjunction with the treatment already proposed including the detention basins, outlet control structures and other Best Management Practices (BMPs), will ensure that total suspended solids (TSS) removal of well over 80% will be accomplished.

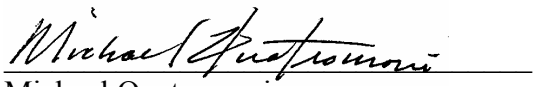
BSC also questioned several of the input variables used by SITEC in performing the stormwater calculations, which were done using HydroCAD software, version 7.00, and offered

recommendations for the revised calculations. These recommendations have been incorporated into the revised stormwater calculations and are listed below:

- The watershed areas for pre-development and post-closure have been revised and now are the same so that flow rates can be compared for similar areas.
- Sheet flow lengths have been revised to fifty (50) feet for both pre-development and post-closure analyses.
- Surface descriptions and the associated velocity factors for shallow concentrated flow, as recommended by BSC, have been revised to be either paved or unpaved conditions for both pre-development and post-closure analyses.
- The time increment "dt" in the calculation settings for the HydroCAD program has been revised from 0.05 hours to the minimum setting of 0.01 hours as recommended by BSC for both pre-development and post-closure analyses.

We hope that this information adequately addresses the questions and comments of the Department and the City of Newburyport concerning the final closure design of the landfill. Should you have any additional questions regarding this supplemental information please do not hesitate to contact me. Thank you for your consideration in this matter.

Sincerely,
SITEC Environmental, Inc.



Michael Quatromoni
Project Manager

cc:
City of Newburyport, MA
J. Morris, Health Department
T. Peter, Conservation
W. Thibeault
S. Trettel, PE
R. Nylan, Esq.

ATTACHMENT 2

REVISED STORMWATER CALCULATIONS

ATTACHMENT 1

GEOCOMP CORPORATION
PRELIMINARY BERM ANALYSIS